

Development of PIN Diode Detector Arrays for 3D Flash LIDAR Space Applications, Phase I

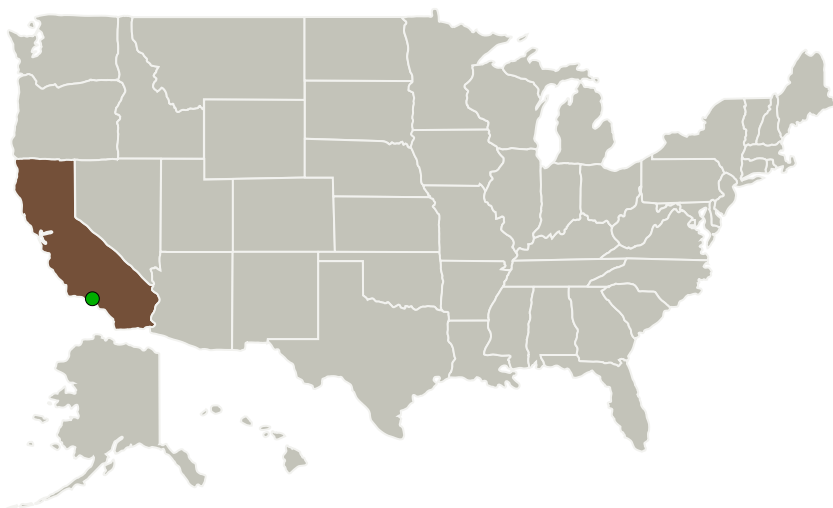
Completed Technology Project (2014 - 2014)



Project Introduction

Advanced Scientific Concepts, Inc. (ASC) has developed a number of 3D Flash LIDAR systems. Flash LIDAR sensors are 3D video systems that return range and intensity for each pixel in real time. ASC's Flash LIDAR has been used for autonomous berthing with the International Space Station and is currently under development for the OSIRIS-REx asteroid rendezvous mission. Flash LIDAR is also being evaluated by JPL and NASA for Entry Decent and Landing for ALHAT and Mars. All of these applications use avalanche photodiode (APD) arrays in the camera focal plane array. APDs are complex epitaxially grown structures and biased at relatively high voltages (50-70V). These arrays have a poor fill factor that is compensated by micro-lenses. These micro-lenses are restricted to F/#s greater than about 3.3 which in turn limits the effective receive aperture. If micro-lenses were unnecessary, an F/1 receive aperture could increase the collection area by a factor of 10 with no increase in noise. This should result in an increased SNR of approximately 40% but, because of the simplicity of PINs compared to APDs, an increase in reliability as well. PINs are more radiation hard than APDs, are more operationally stable (therefore do not require individual fuses to protect against the development of high dark current pixels), inherently have lower dark current (lower noise), and are inherently more uniform. In addition low-voltage FPA drive electronics is easier to design than high voltage circuitry. These improvements will result in a more reliable higher performance array.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Advanced Scientific Concepts, Inc.	Lead Organization	Industry	Goleta, California
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

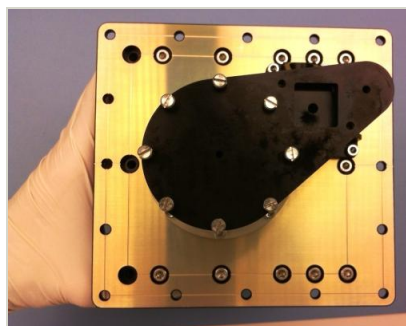
California

Project Transitions

**June 2014:** Project Start**December 2014:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/137496>)

Images

**Briefing Chart**

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(<https://techport.nasa.gov/image/128573>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Advanced Scientific Concepts, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

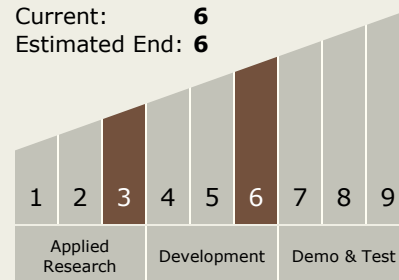
Brad Short

Technology Maturity (TRL)

Start: 3

Current: 6

Estimated End: 6



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Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
 - └ TX09.4 Vehicle Systems
 - └ TX09.4.7 Guidance, Navigation and Control (GN&C) for EDL

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System